IMPACT AND EPIDEMIOLOGY OF SLEEP DISORDERS

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We know that one in seven Americans have a chronic sleep/wake disorder, and although similar data are not available for other Western countries the figures are probably similar. In developing countries factors such as poverty have a profound influence on sleep. In India, for example, it is estimated that one third of the population goes to sleep where they are standing when it is time to sleep.

Europe has the highest proportion of elderly people, in whom many sleep problems, such as insomnia and sleep apnoea, are more common. When taken together with the fact that hypnotics are among the most widely prescribed drugs, the impact of sleep disorders and their treatment merits particular attention in Western society. The United Kingdom, however, has lagged behind other countries in terms of developing specialised facilities for treating sleep disorders.

At present the impact of sleep disorders on morbidity and mortality is not widely appreciated. This article provides basic information about the epidemiology of a range of sleep disorders and highlights some of the implications of sleep disorders.

Impact of sleep disorders

Prevalences of some sleep disorders

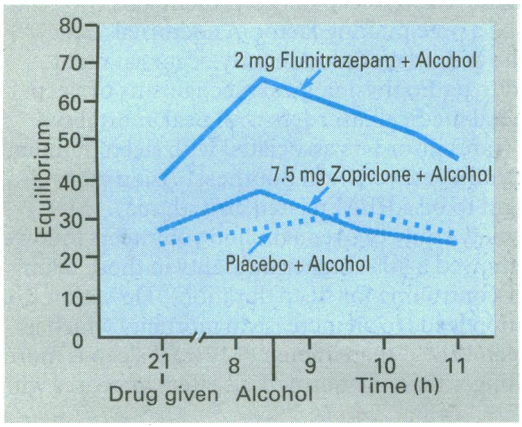
Narcolepsy	Estimated 0·15%
Obstructive sleep apnoea syndrome	2%; most common in middle aged overweight men
Restless legs syndrome	Definitive data not available; symptoms have been identified in 5-15% of normal subjects, 11% of pregnant women, 15-20% of patients with uremia, up to 30% of patients with rheumatoid arthritis
Shiftwork sleep disorder	Estimated 2-5%
Sleepwalking	1-15%; more common in children than in adults
Sleep terrors	3% of children, < 1% of adults
Nocturnal leg cramps	Definitive data not available; up to 16% of healthy people
Nightmares	10-50% of children aged 3-5 years have nightmares that disturb their parents; about 50% of adults have occasional nightmares and 1% frequent nightmares (≥ 1 a week)
Sleep paralysis	40-50% of normal subjects have isolated occurrences in lifetime; 40% of patients with narcolepsy
Impaired sleep related penile erections	> 10% men have chronic erectile dysfunction
Sleep enuresis	30% of 4 year olds, 10% of 6 year olds, 5% of 10 year olds, 3% of 12 year olds, 1-3% of 18 year olds; primary enuresis comprises 70-90% of all cases, secondary enuresis 10-30%
Insomnia	30% in one year. A third say the problem is severe
Primary snoring	40-50% of men and women > 65 years
Sudden infant death syndrome	Estimated to occur in 1-2/1000 live births
Parkinsonism (for comparison)	0·1-0·3%; may be as high as 20% of those > 60 years of age; 60-90% of people treated for Parkinson's Disease have sleep complaints

For many sleep disorders there is an associated increase in daytime sleepiness and an increase in road traffic accidents. The effect of disruption of circadian rhythms has an impact both at the time of the disruption (for example, in shift workers or the effects of jet lag) and well beyond that time—for example, there is greater sleep disruption in former shift workers 10 years after stopping shift work than in controls who have never worked shifts. It is speculative but plausible that the higher incidence of complaints of insomnia in middle aged and older women is a consequence of longstanding disrupted sleep during child rearing (at a time when the sleep drive is strong), which produces its effects 15 to 25 years later.

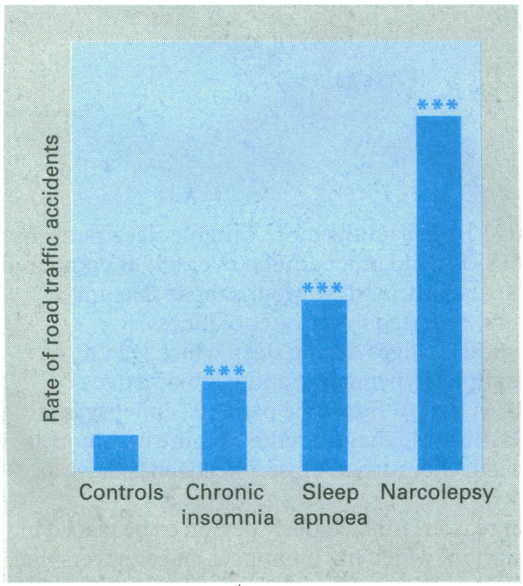
In many medical disorders sleep disruption makes coping with the disorder more difficult. With most sleep disorders there are many general effects—attenuation of school and work ability and opportunity, psychosocial consequences, and a constriction of leisure and pleasure time. There are specific effects linked with each condition.

Number and cost of hypnotic drugs (BNF section) prescribed in the United Kingdom in 1989 and in Scotland alone in 1989 and 1991 (for comparison)

	No of prescriptions	Gross ingredient cost (£)
	United Kingdom, 1989	
Hypnotics (4.1.1)	14 834 000	20 871 170
Anxiolytics (4.1.2)	7 586 000	6 147 590
Barbiturates (4.1.3)	306 000	516 020
	Scotland, 1989 (1991)	
Hypnotics (4.1.1)	1 744 803 (1 682 256)	2 789 362 (3 255 958)
Anxiolytics (4.1.2)	850 374 (800 678)	641 607 (864 282)
Barbiturates (4.1.3)	23 985 (16 614)	39 745 (32 576)



The interaction with alcohol is not the same for all hypnotics.



Number of road traffic accidents in patients with three sleep disorders compared with controls. (Stars indicate a high statistical significance.)

Sleep apnoea

In the case of sleep apnoea, an association with increased risk of myocardial infarction and stroke has been reported. Cognitive deterioration, presumably on the basis of repeated nocturnal hypoxia and sleep disruption, has been described in a number of studies, and personality change, in part related to continuous fatigue, leading to marital friction and divorce or difficulties in the workplace is not uncommon. In comparison with other sleep disorders, we have recently found that this condition has more illness intrusiveness impact on the spouse than on patients with apnoea themselves.

Insomnia

There is a tendency for many doctors to trivialise the complaint of insomnia. It is an extremely common symptom and is often self-limiting. In up to 80% of cases the insomnia seen in general practice is related to anxiety and depression. Even in specialised clinics one third of insomniac patients have a psychological cause for their insomnia and if added to drugs and alcohol as causes, this would constitute half of all cases seen. Perhaps doctors' subjective experience, together with the well recognised mismatch of subjective estimates of sleep time and objective sleep time recorded by polysomnography, and the psychological emphasis in many patients has led doctors and some sleep specialists to take a minimal approach to the insomniac patient.

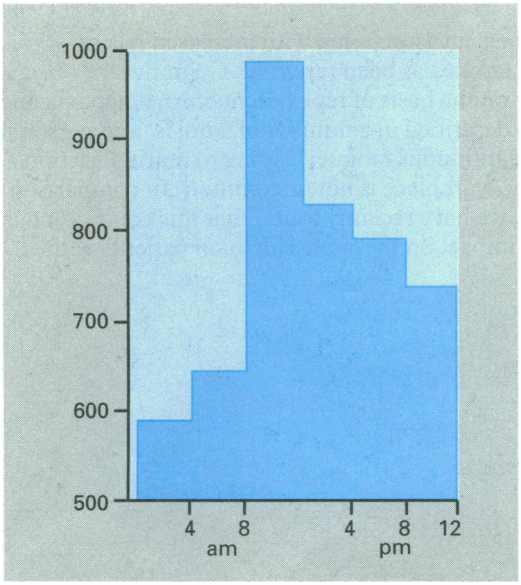
Only about one in 256 patients with insomnia present to their general practitioner. Of these, most raise the issue when seeing the doctor for another reason. Despite these difficulties in diagnosing and treating insomnia there are 215 million prescriptions for hypnotics in Britain annually. Many people with insomnia resort to ineffective or dangerous self-treatment regimens. The impact of sleep disruption in severe cases of insomnia can be considerable, and especially when associated with other conditions, such as Parkinson's disease, can be the trigger for suicidal behaviour.

The consequence of treatment of insomnia can be profound. Some hypnotics interact with alcohol. The impact of long term use of benzodiazepines may impair cognitive powers, especially in elderly people. However, the relief of severe insomnia both is humane and may help to prevent insomnia triggering depression or mania in a variety of illnesses.

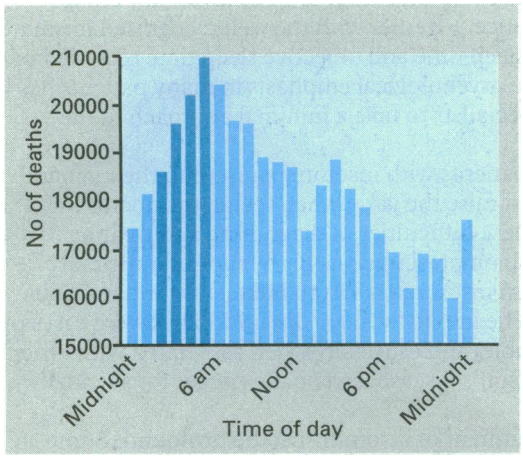
Narcolepsy

Narcolepsy is reputed to be the disorder with the longest duration from onset of symptoms to diagnosis. The treatment, with psychostimulants, carries with it specific problems. Studies of impact on quality of life for a variety of disorders, including multiple sclerosis and chronic renal failure, rate narcolepsy second only to quadraplegia.

Sleep and death



Circadian distribution of deaths from ischaemic heart disease in Scotland, 1982.



Circadian distribution of 437 511 deaths (from death certificate data).

Historically, humans have held an ambivalent attitude to sleep. In Greek mythology, Nyxt (Night) had two sons, Thamus (Death) and Hypnos (Sleep). The juxtaposition of these two has led to the misconception that sleep is a passive period contrary to the recognised active restorative processes that occur in sleep.

Some authors have identified the small hours of the morning as a time of particular risk. For example, F Scott Fitzgerald wrote in 1945 "In the real dark night of the soul it is always three o'clock in the morning." Many studies show an increased mortality in the late sleep and early waking hours. Most doctors are now aware that noctural asthma is particularly pronounced in the latter part of sleep and many recognise that most REM sleep occurs in the later part of the night. These observations may be linked. Asthma, for example, is not commonly fatal, but of those dying of asthma, most die during the night. The lack of autonomic nervous system control during random eye movement (REM) sleep may represent a risk period for health and may be a precipitating factor in nocturnal death. Sudden infant death syndrome predominantly occurs at night and is thought to be related to pathophysiological mechanisms of sleep. There are a number of general medical disorders with peak mortality at night, as well as specific (rare) disorders associated with sleep (familial fatal insomnia, nocturnal death—especially in Southeast Asian men [Pok-kuri]—which is thought to be a REM related arrhythmia).

An American Cancer Society study of over a million volunteers followed prospectively for six years showed a 50% higher mortality in those taking sleeping pills "often" (after controlling for sleep duration). Deviation from age appropriate sleep duration leads to an increase in mortality which is more pronounced in women (168%) than in men (129%) if sleep is more than two hours shorter or longer than the norm. This effect increases with age.

Sleep disorders such as sleep apnoea, particularly when associated with other medical diseases, are associated with increased mortality. In a study of elderly women in nursing homes those with a respiratory disturbance index of over 50 survived only 17% as long as those with an index of less than 30, and all those with an index over 50 died at night.

Sleep related morbidity

Some changes during sleep that lead to increased morbidity

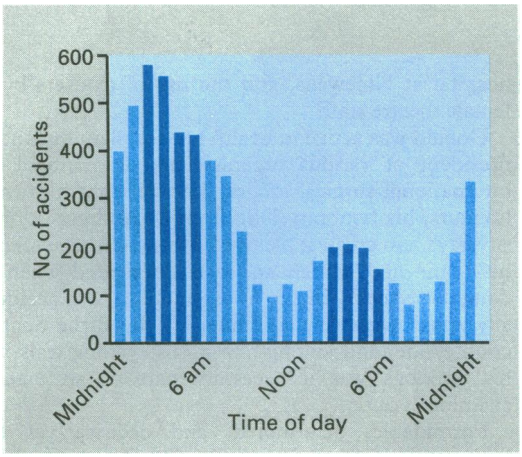
- Diminished hypercapnic and hypoxic drive
- Increased gastro-oesophageal reflux
- Onset of certain patterns of headache

In a random survey of 9003 British adults more variable sleep patterns were found among young (18-34) and older adults (over 65) as compared with middle aged adults. Particularly in these groups those sleeping a "normal" amount (7-9 hours) reported lower rates of illness.

There are pathophysiological changes during sleep which lead to increased morbidity (for example, hypercapnic and hypoxic drive is diminished, especially in REM sleep). For some patients, epilepsy is exclusively sleep related. Gastro-oesophageal reflux is more common at night. Certain patterns of headache, such as cluster headaches, have an onset during sleep.

One of the most common reasons for an elderly person to be placed in long term care is sleep disruption, which has an impact on caregivers that becomes intolerable. Many other sleep related disorders lead to admission to hospital, diminished productivity, and in several circumstances to more direct cost as a consequence of fatigue related accidents.

Sleep and accidents



Circadian distribution of 6052 road traffic accidents judged to be fatigue related.

There is a peak of fatigue in the early hours of the morning and a second peak in the mid-afternoon. These peaks of fatigue are similar to peaks in the incidence of road traffic accidents that occur in a similar time distribution. Studies suggest that 20% of all drivers have fallen asleep behind the wheel at least once. One third of heavy trucking accidents which result in the driver being killed is attributed to fatigue. Studies in airline pilots with on board electroencephalographic recordings have documented sleep in some pilots while flying jets. Disruption of sleep pattern is thought to be a major factor.

Several studies have found a twofold to a sevenfold increase in road traffic accidents in patients with sleep apnoea. In one study, 60% of these patients described falling asleep at the wheel at least once while driving and a quarter falling asleep at the wheel at least once a week.

Sleepwalking not infrequently leads to accidents but occasionally leads to death, and rarely sleep related homicide is reported.

Financial impact of sleep deprivation and sleep disorders

Studies have shown that insomnia is as powerful a predictor of early death as obesity

Sleep disruption and sleep disorders have a profound effect on individual people and on society. An awareness of the specific disorders and their treatments is an essential part of modern medicine

One estimation in the United States set the cost to society of sleep related problems as 16 000 billion dollars annually. Loss of productivity as a consequence of shiftwork and the increased medical care of shiftworkers, admission to hospital of elderly people with sleep disruption, and the costs of accidents contribute in these calculations. Of this only a small fraction is spent on specific treatments and the training of medical staff. At present, the vast majority of patients with sleep disorders remain undiagnosed and untreated.

There are many other factors which can be considered in the broader issue of costs of sleep disorders. Several large studies have shown that insomnia is as powerful a predictor of early death as obesity. This implies both a human and financial cost associated with this sleep symptom.

The increase in work time (8% in the last quarter of a century) has had the consequence of reducing leisure time and sleep time. The consequence of this is fatigue and change in quality of life. These features are almost never evaluated in studies of wellbeing, although the diminution of both productivity and impaired performance (for example, among doctors working long hours or shift patterns) is increasingly documented. The erosion of sleep time in adolescents (almost 20% in this century) may have profound and long lasting impact on society if these adolescents are more sleepy and less able to learn.

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This is the last article in the ABC of Sleep Disorders, which has been edited by Professor Shapiro. The series will be published as a book in the autumn of this year.

ONE HUNDRED YEARS AGO

AN IMPROVED HAT.

I send by the same post as this letter a hat, which I have designed for the prevention of baldness. The idea is to prevent pressure on the arteries passing to the scalp and the veins passing therefrom by the application of pads to the leather of the hat in certain positions. You will observe three pads in front, one central and two lateral; between these there is an interval on each side in which the frontal artery and supraorbital nerve rest; passing backward the next interval forms a large interval for any variations of the temporal artery and its two branches, and the next interval is for the occipital artery. The small space between the two posterior pads is simply for the external occipital protuberance. On placing the hat on the head there is no constriction therefore cutting off the blood supply and causing atrophy of the scalp and hair, and further the head is thoroughly ventilated so that the hat feels much lighter than the same hat without the pads.

The pads are made of amadou, which has the advantages of being extremely light, capable of absorption, somewhat antiseptic, and velvety to the touch. They are fastened to the "leather" by means of a solution of india-rubber, which does not dissolve from the heat of the head or perspiration.

Leeds. WM. SUMMERSKILL, L.R.C.P., M.R.C.S.Lond.

(*BMJ* 1893;ii:19.)